

**Case Report**

## Common Trunk of the Inferior Pulmonary Veins in a Patient with Paroxysmal Atrial Fibrillation

Satoru Miyanaga MD, Taro Date MD, Teiichi Yamane MD, Keiichi Inada MD, Kenri Shibayama MD, Seiichiro Matsuo MD, Hidekazu Miyazaki MD, Yasuko Kanzaki MD, Ken-ichi Sugimoto MD, Seibu Mochizuki MD

Division of Cardiology, Department of Internal Medicine, Jikei University School of Medicine, Tokyo, Japan

Herein we report a case of a patient presenting with paroxysmal atrial fibrillation (PAF) in whom the pulmonary veins (PVs) had a common inferior trunk and PV isolation at the common inferior trunk was successfully performed to prevent recurrence of PAF. A 58-year-old man with drug-resistant PAF was referred to undergo curative treatment at our institution. A three-dimensional image of the PVs re-constructed by contrast-enhanced multi-detector computed tomography before the operation revealed a common inferior trunk of the PVs (24-mm diameter). Segmental ostial PV isolation with the guidance of a circular mapping catheter was performed for both superior PVs and the common inferior PV trunk. All three PV ostia were successfully isolated from the LA, and the patient has been free from PAF thereafter for 18 months. Preprocedural multi-detector computed tomography or magnetic resonance imaging to evaluate the anatomy of PVs (the number, size, and shape) is thus considered to be useful for performing safe and smooth catheter ablation in patients with PAF. (J Arrhythmia 2006; 22: 115–118)

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**Key words:** Paroxysmal atrial fibrillation, Pulmonary vein, Catheter ablation, Anatomy, Computed tomography

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### Introduction

The pulmonary veins (PVs) play an important role not only in triggering but also in maintaining paroxysmal atrial fibrillation (PAF). Recently, catheter-based pulmonary vein isolation (PVI) has been widely performed for patients with PAF.<sup>1,2)</sup> Although the majority of such cases shows the typical branching pattern of PV ostia, recent investigations have demonstrated some varieties in the PV

anatomy, such as the common trunk of ipsilateral PVs.<sup>3,4)</sup> Herein we report the case of a PAF patient whose PVs had a common inferior trunk and PVI at the common inferior trunk was successfully performed.

### Case Report

A 58-year-old man presented with the chief complaint of palpitations of two years duration. Holter electrocardiogram (ECG) recordings showed

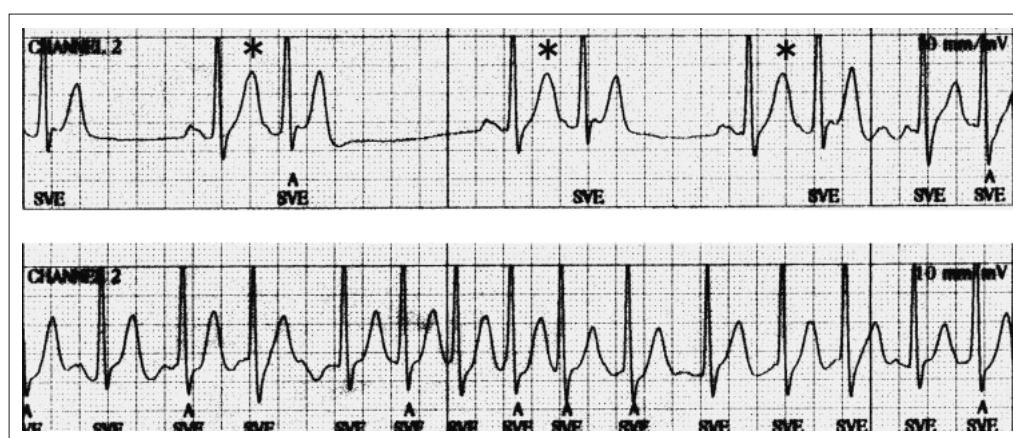
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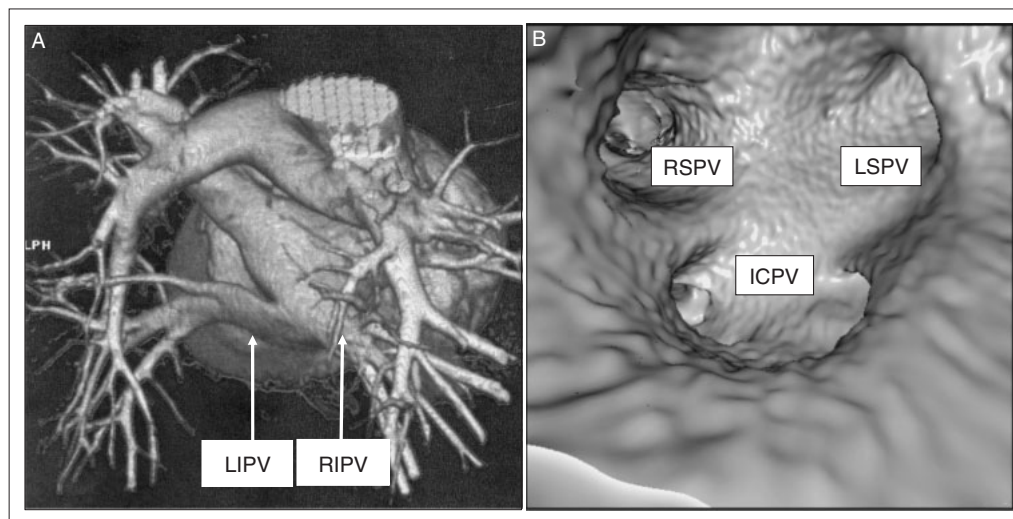
Address for correspondence: Taro Date MD, Division of Cardiology, Department of Internal Medicine, Jikei University School of Medicine, 3-25-8, Nishi-shinbashi, Minato-ku, Tokyo 105-8461, Japan. Phone: 81-3-3433-1111 Fax: 81-3-3459-6043  
E-mail: [datet@jikei.ac.jp](mailto:datet@jikei.ac.jp)

frequent short coupling premature atrial contractions (PACs) and initiated PAF from “P on T type” PAC (Figure 1). Several antiarrhythmic drugs (disopyramide, flecainide, bepridil) to maintain the sinus rhythm were not effective. He was therefore referred to our institution to undergo curative treatment for drug-resistant PAF. Twelve-lead ECG recorded during sinus rhythm, chest radiograph, laboratory tests, and two-dimensional echocardiogram were all unremarkable. Three-dimensional images of the PVs re-constructed by contrast-enhanced multi-detector computed tomography (MDCT) revealed a common inferior trunk of the PVs (24-mm diameter) (Figure

2A). An endoscopic image of the PVs and left atrium (LA) re-constructed by MDCT showed a large common ostium of inferior PVs (Figure 2B). Both superior PVs were shown to be anatomically normal. Segmental ostial PVI with guidance of a circular mapping catheter (Lasso, Biosense-Webster) was performed for both superior PVs and the common inferior trunk of PVs. Radiofrequency energy was delivered to the LA-PV junction by 8-mm distal electrode of 8 French thermo couple-equipped catheter (EP technologies). For the common inferior trunk of PVs, a 25-mm diameter Lasso catheter was placed at the common ostium (LA-PV junction) and

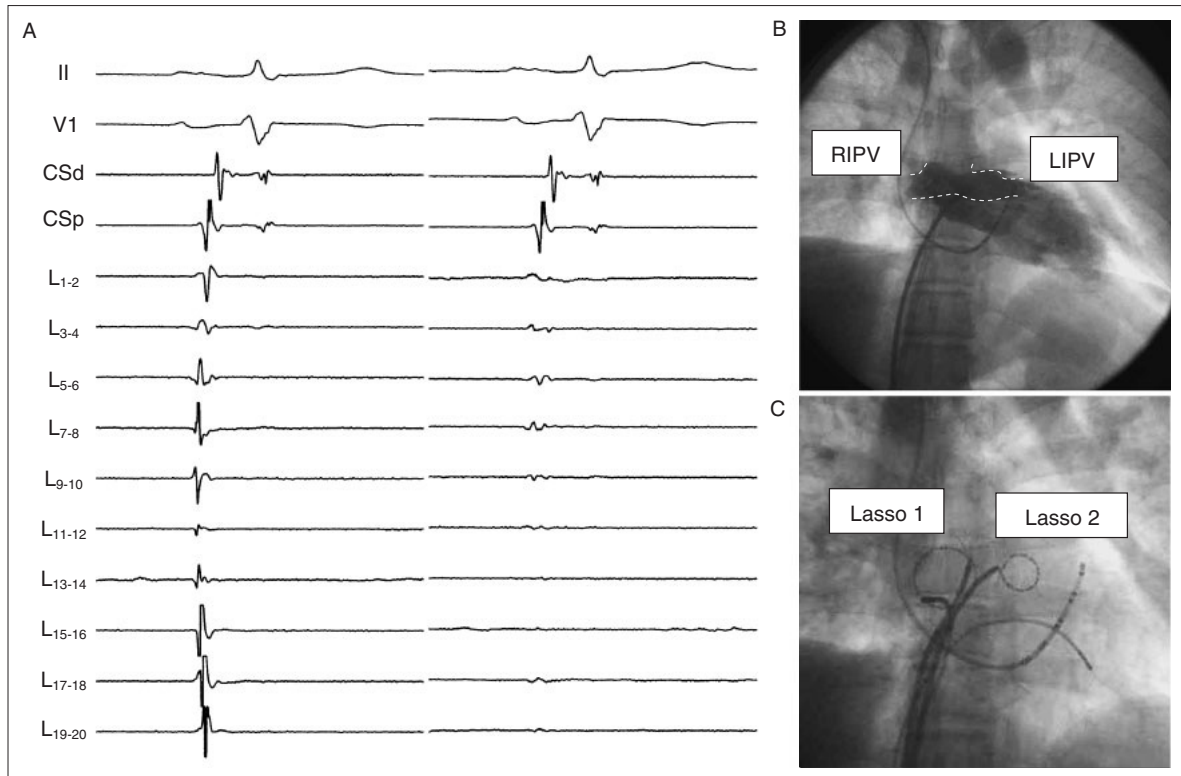


**Figure 1** Ambulatory electrocardiography showing frequent short coupling premature atrial contractions (PACs) (arrow) and the initiation of AF from “P on T type” PAC (asterisk).



**Figure 2**

A. Three-dimensional image of the PVs reconstructed by contrast-enhanced multidetector computed tomography (MDCT) revealed a common inferior trunk of the PVs. B. Endoscopic image of the PVs and the left atrium (LA) re-constructed by MDCT showed the large common ostium of the inferior PVs. RIPV: right inferior pulmonary vein (PV), LIPV: left inferior PV, ICPV: inferior common PVs.



**Figure 3**

A. Representative traces demonstrating the complete disappearance of the PV potentials of common inferior PVs by circumferential segmental PV isolation from the surface electrocardiographic leads II, V1 and from intracardiac electrograms of the distal coronary sinus (CS-d), proximal coronary sinus (CS-p), and a distal (L<sub>1-2</sub>) to proximal (L<sub>19-20</sub>) Lasso catheter in the inferior common PVs (Lasso 1 in C). B. An angiogram of the inferior common PVs in an anteroposterior (AP) view. LIPV: left inferior PV RIPV: right inferior PV. C. Two Lasso catheters placed around the orifice of both inferior common PVs (Lasso 1) and left inferior PV (Lasso 2) in an AP view.

a 15-mm diameter Lasso catheter was also inserted at the bifurcation to the left inferior PV (**Figure 3**). Radiofrequency energy was applied to the proximal site of the common ostium 11 times (each application was limited to 90–120 seconds) and all PV potentials were then eliminated in a stepwise manner (**Figure 3**). Finally, all three PVs were successfully isolated from the LA at their junction. The patient has been completely free from AF thereafter for 18 months.

### Discussion

The anatomy of the PVs has been shown to be variable, and an anomaly of the LA-PV junction was observed in 19–38% of patients with PAF.<sup>3,4)</sup> Recent evidence has shown a considerable number of the patients to have either a common ostium on the left or right. Scharf et al. reported 3% of such patients to have a common left PV and 16% to have a separate right middle PV, as analyzed by MDCT, in 58 patients with AF.<sup>3)</sup> Kato et al. also demonstrated

the branching pattern of PVs in the patients with PAF and control patients evaluated by magnetic resonance imaging (MRI). Although a typical branching pattern (two left and right PVs) was observed in more than half of the patients with PAF, the others had either a common left trunk, right upper, or right middle PV.<sup>4)</sup> Although the confluence of the ipsilateral left or right PVs have already been described, there have been no reports on confluent inferior PVs. In the presented patient, the confluent inferior PV, which was demonstrated by preoperative MDCT, was confirmed by a direct contrast medium injection during an electrophysiological study and they were then successfully isolated from the LA at its ostium. During differentiation of the atrium, the primitive atrium sprouts a pulmonary vein, which branches into right and left pulmonary branches.<sup>5)</sup> These veins bifurcate again to produce a total of four pulmonary veins. It is imaginable that this patient might have had a malformation of pulmonary vein branching in the final bifurcating

process of pulmonary veins. A common left pulmonary vein has been shown to be a consistent source of arrhythmogenic atrial ectopy.<sup>6)</sup> We failed to document a P wave morphology of atrial ectopy triggering AF before and during the PVI procedure. No arrhythmogenic atrial ectopy was observed during the electrophysiological study. Preprocedural knowledge of the existence of PVs with a common ostium may influence the ablation procedure and thus make it possible to perform prompt radio-frequency application at these levels. When the common ostium of PVs is unrecognized before the procedure, it may take much more time to evaluate all PV orifices and select an appropriately sized Lasso catheter. We usually use the large-size Lasso catheter for the electrical disconnection between the LA and the common trunk of PVs to avoid PV stenosis. In the present patient, a large-size (25-mm diameter) Lasso catheter, which was selected according to the measured size on the angiographic view, was extremely useful for the isolation of the common inferior PV trunk.

In conclusion, herein we reported a patient with PAF who had a common inferior trunk of the PVs, in whom PVI at the common inferior trunk was successfully performed. We would like to emphasize that the recognition of anatomical varieties by preoperative MSCT or MRI is extremely important for the performance of safe and smooth ablation procedures.

Other images of this case than those presented in this report were published in *J Cardiovasc Electrophysiol*, 2005; 16: 107.<sup>7)</sup> The present report illustrates electrophysiological findings of this case with an endoscopic image of the multislice CT.

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